

A Guide to the Diagnosis and Management of 17 CDC Category B Bioterrorism Agents (“BEWARE OF GERMS”)

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This poster is for strictly educational purposes and should not be used to select specific diagnostic or therapeutic choices. Contact your local Department of Health if any of these diseases are even suspected and ask for guidance on specific tests and therapies. Some antibiotics are not FDA-approved for the indications listed.

	Ornithosis (Psittacosis)	Food		Glanders	E-Coli 0157-H7	Rickettsia		Melioidosis	Staphylococcus (Staph enterotoxin B (SEB))
Microbiology	<i>Chlamydia psittacii</i> . A chlyamdia bacteria and thus not seen on gram stain or grown in routine culture. Infected psittacine birds (parrots, parakeets), but also > 100 other birds and poultry (e.g., turkeys). Thus, "ornithosis" is a more inclusive term than "psittacosis".	Salmonella A gram-negative (red) rod shaped bacteria. Multiple serotypes (e.g. the two most common are <i>S. Typhimurium</i> and <i>S. enteritidis</i>). Serogroups include Salmonella serogroup Typhi (<i>S. typhi</i>), the cause of Typhoid Fever.	Shigella A gram-negative (red) rod shaped bacteria. Four species: Shigella (S.) dysenteriae, flexneri, boydii, sonnei.	<i>Burkholderia mallei</i> . A gram-negative rod bacteria with a "safety-pin" shape. Aerosolized as a BT agent.	Gram-negative rod bacteria. E-Coli Serotype "O157-H7". Produces a toxin ("Shiga"). See www.cdc.gov Category B agents "Escherichia coli O157-H7.	Q-fever ("Query-fever") <i>Coxiella burnetii</i> . A rickettsial bacteria and thus not seen on gram stain or grown in conventional cultures. Aerosolized as a BT agent. Highly infectious with < 5 inhaled organisms causing disease.	Typhus <i>Rickettsia prowazekii</i> bacteria. Causes "Epidemic or Louse-borne Typhus" distinct from other rickettsia that cause murine typhus and scrub typhus. Rickettsia organisms not seen on gram stain or grown in routine cultures.	<i>Burkholderia pseudomallei</i> . A Gram-negative rod bacteria that can have a "safety-pin" shape. Aerosolized as a BT agent.	Staphylococcus aureus producing a "superantigen" toxin acting on the intestine ("enterotoxin") if in food or water. Acting on the lung if aerosolized as a BT agent. SEB is one of multiple toxins that can be made by Staph Aureus, a gram-positive (purple) round, aerobic bacteria appearing like clusters of grapes.
Precautions	Standard. Person-to-person transmission has been suggested but not proven. CDC/MMWR Recomm Rep 2000;49 (RR-8): 3-17 Infection by inhalation of dried secretions from birds. Aerosolized as a BT agent.	Standard and contact. Transmission by food, water, or contact with animals. www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis. No person-to-person spread by air.	Standard and contact. No person-to-person spread by air, but spread by hand contact. Small amount of bacteria needed to cause disease. Transmission by food, water, or flies (www.cdc.gov/ncidod/dbmddiseaseinfo/higellosis_t.htm).	Standard. Contact if skin lesions present. No person-to-person spread by air. Not found in water or soil (unlike melioidosis). Can also infect horses. See recent case report of glanders in a military microbiologist: NEJM 2001; 345:256-258.	Food-and-water-borne threat: found in ground beef and salami, lettuce and sprouts, unpasteurized milk and juice; under-chlorinated drinking water, or swimming in infected pools, lakes, or other bodies of water. Transmitted by fecal-oral route from person-to-person. No person-to-person spread by air.	Standard. USAMRIID. Med Management Bio Casualties handbook. 4 th Ed (2001).p. 42. Human to human transmission rare. www.cdc.gov/ncidod/dvrd/qfever/index.htm. Can infect ticks (Dermacentor), sheep, goats, and cats, especially their placental tissue and milk.	Standard and Contact. No person-to-person spread by air. Spread by body lice. Delousing with an insecticide known to kill infecting lice. Removal of involved clothing. Estimated 30 million cases, with 3 million deaths, 1918-1922 in Soviet Union and Central Europe.	Standard. Contact if skin lesions. No Person-to-person spread by air. Does exist in soil and water, especially in tropical regions of Asia And northern Australia.	No person-to-person spread by air. Avoid contaminated food or water.
Clinical Features	Incubation period 6-19 days. (www.cdc.gov/ncidod/dbmd/diseaseinfo/psittacosis_t.htm) Pneumonia primarily. Chest X-ray: Focal infiltrates in ~75% +/- hilar enlargement. Extrapulmonary organ involvement such as hepatitis, splenomegaly, rashes, DIC, headache, meningoencephalitis, seizures, renal, pan-cardiac lesions. Principles & Practice of ID textbook. 5 th Ed. 2000. p. 2005.	<u>Salmonellosis</u> (non-typhoid fever gastroenteritis): Incubation period 6-48 hours. Fever, abdominal pain, diarrhea (can be bloody, but not necessarily). Occasionally, septic arthritis or chronic arthritis. <u>Typhoid Fever</u> : Incubation period 5-21 days. Fever, diarrhea NOT common, can have constipation, vomiting typically mild-moderate, malaise, occasionally intestinal adenopathy with perforation, delerium.	Fever, abdominal pain, diarrhea: bloody (dysentery) or watery. Can develop hemolytic-uremic syndrome, HLA-B27 Reiter's syndrome.	Acute form: Incubation period 10-14 days. Usually fatal without therapy. Pneumonia +/- fulminant sepsis. Fever, generalized erythroderma, hepatosplenomegaly with abscesses, adenopathy, can have papular or pustular skin lesions (may suggest smallpox). Chronic form: Skin lesions/multiorgan abscesses.	Diarrhea, often bloody. Kidney failure ("Hemolytic-Uremic syndrome") with break down of red blood cells, some with stroke, seizure, intestinal ischemia.	Incubation period: Varies widely (10-39 days) depending on the number of infecting organisms. Most patients become ill within 2-3 weeks after exposure. www.cdc.gov/ncidod/dvrd/qfever/index.htm Acute form: Flu-like or atypical pneumonia. Fever, cough (1/4), myalgias, headache, pleuritic chest pain (1/4), hepatitis (1/3), aseptic meningitis, encephalitis. Chest x-ray: patchy infiltrates, rounded opacities +/- adenopathy.	Incubation period ~ 1 week. Sudden onset fever (can become unremitting), severe malaise, headache, myalgia. ~ day 5 a rash begins in the AXILLARY folds and upper trunk then spreads over whole body except face, palms, and soles. Fever can last 2 weeks unless treated. Mortality can be up to 40%, higher in the elderly. Saah. A. Principles & Practice of ID textbook. 5 th Ed. 2000. p. 2051.	See glanders. Nearly always fatal untreated. Incubation period: 10-14 days. Acute form(s): Pneumonia and/ or fulminant sepsis. Erythroderm or skin papules/pustules (can be confused with smallpox), multiorgan abscesses. Chronic form: skin and visceral abscesses.	<u>Ingestion</u> : After 1-12 hours: Vomiting, diarrhea. <u>Inhalation</u> : After 3-12 hours: "Flu-like" fever, cough, dyspnea due to pulmonary edema, chest pain, possible respiratory failure. Incapacitates often, and can be lethal. CxR: normal or pulmonary edema. Inhaled toxin can be swallowed and then vomiting and diarrhea occur.
Diagnosis	Clinically non-specific. IgM and IgG antibody assays to detect immune response. PCR, antigen detection, and specialized cultures to detect the organism itself. Early appropriate antibiotics can block a diagnostic antibody response from developing.	Cultures of blood or stool; or bone marrow (typhoid fever). Alert Microlab that Salmonella must be ruled out in cultures so that appropriate culture media is used and biochemical tests performed.	Blood and stool cultures. Alert Microlab that Shigella must be ruled out in cultures so that appropriate culture media is used and biochemical tests performed.	Blood cultures negative until very ill. Biosafety Level ("BSL") 3 lab precautions. Chest x-ray: lobar infiltrates +/- cavities, +/- military nodules, +/- adenopathy. Complement-fixation Ab test: one titer of 1:20 or higher supports diagnosis if clinical glanders present.	Cultures of stool and blood. Alert the Microlab that E-Coli O157-H7 must be ruled out so that appropriate culture media (sorbitol-MacConkey agar) and specific tests will be performed to distinguish this E-Coli from more the more routine E-Coli.	Clinical plus antibody tests. ELISA more sensitive than complement fixation. IgM antibodies may be detected by the second week after infection. USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). p.42. CDC website states that "In most laboratories, the IFA is the most dependable and widely used method".	Clinical and epidemiologic. Older antibody tests can be non-specific (Weil-Felix reaction). PCR or other newer assays preferable via reference labs.	Need BSL-3 due to aerosol lab risk. Blood cultures. Complement fixation test: one titer > 1:160 supportive of diagnosis if clinical melioidosis present.	Clinical and outbreak epidemiology. Lab: Toxin antigen detection (ELISA) in clinical and environmental specimens. Toxin detection may be transient, but may be found in serum, urine, nasal swabs and respiratory specimens within initial 24 hours. Antibody tests require rise between acute and convalescent titers. USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). p.83.
Prophylaxis/Vaccines	No FDA-licensed vaccines. No antibiotic prophylaxis currently recommended.	FDA-licensed vaccine(s) (oral and parenteral) against typhoid fever only. NO defined role for prophylactic antibiotics.	No FDA-licensed vaccine. NO recommendation for prophylactic antibiotics. If used, however, should be based on antibiotic susceptibility results as soon as available because of potential for drug-resistant Shigella.	No FDA-licensed vaccine. No prophylactic drug(s) proven effective. (Oral trimethoprim-sulfamethoxazole (TMP-SMX) "may be tried". USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). p. 34.	NO FDA-licensed vaccines. No chemoprophylaxis.	No FDA-licensed vaccines. Investigational (IND) US vaccines. Commercially available licensed vaccine in Australia. Chemoprophylaxis begun too early in the incubation period may delay but not prevent the onset of symptoms. Can use Doxycycline 100mg po BID, or tetracycline 500mg po q6hours for 5-7 days. USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). p.43.	No FDA-licensed vaccine. No recommended antibiotic prophylaxis	NO FDA-licensed vaccines or post-exposure antibiotics proven to work. (Oral trimethoprim-sulfamethoxazole (TMP-SMX) "may be tried" USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). P. 34.	No FDA-licensed vaccine. No role for prophylactic antibiotics as preformed toxin binds as a "superantigen" to MHC Class II sites on antigen-presenting cells, and in < 5 minutes can activate large numbers of T-cells with resulting "pro-inflammatory cytokine storm".
Therapy	Doxycycline 100mg po BID, or tetracycline 500mg po QID for 10-21 days. Erythromycin is the 2nd line drug, but may not be as efficacious. Schlossberg D. Principles & Practice of ID textbook. 5 th Ed. 2000. p. 2006 May require ICU and respiratory support.	<u>Salmonellosis</u> : Antimicrobials should not be used routinely to treat uncomplicated nontyphoidal Salmonella gastroenteritis due to increased risk of relapse of this usually self-limited illness. Miller & Pegues. Principles & Practice of ID textbook. 5 th Ed. 2000. p. 2355. <u>Typhoid Fever</u> : Ciprofloxacin 500mg po for 10 days or Ceftriaxone 1-2 g/day IV can be given initially. If sensitive, other drugs such as ampicillin or TMP-SMX could be used.	Based on antibiotic susceptibility testing. For example, Trimethoprim-sulfamethoxazole double strength (DS) (i.e., TMP 160mg +SMX 800 mg) for 3-5 days, or a susceptible quinolone antibiotic such as ciprofloxacin 500mg po BID. Dupont H. Principles & Practice of ID textbook. 5 th Ed. 2000. p. 2367.	Based on antibiotic susceptibility testing. If sensitive, treat severe disease with Ceftazidime TID plus TMP-SMX q6hours for two weeks, then oral drug(s) for six months. Rx localized or mild disease with 2 oral drugs for 30 days, then one oral drug for 60-150 days. If sensitive, choose two of three possible oral drugs: Amoxacillin-clavulanate TID, tetracycline TID, TMP-SMX BID. USAMRIID. Med Management Bio Casualties Handbook. 4 th edition (2001). p. 34-35.	Supportive. May need ICU, dialysis, and/or intestinal surgery. Evidence that antibiotic therapy increases the risk of Hemolytic-Uremic Syndrome (HUS). NEJM 2000; 343:1930-36. Most persons recover without antibiotics or other specific treatment in 5-10 days. www.cdc.gov Category B agents E-Coli O157-H7 FAQs.	Doxycycline 100mg po BID for 15-21 days is cited on the CDC website, and a shorter course of 5-7 days by USAMRIID. Ciprofloxacin may be considered because it is active in vitro; however, it is unproven in clinical trials.	Doxycycline 100 mg po BID until 2-3 days AFTER resolution of fever. Historically, TCN or oral chloramphenicol (not available in the USA) were used. Saah A. Principles & Practice of ID textbook. 5 th E.2000. p.2052.	See Glanders. Based on antibiotic susceptibility testing. If sensitive, treat severe disease with Ceftazidime TID plus TMP-SMX q6 hours for two weeks, then oral drug(s) for six months. Rx localized or mild disease with 2 oral drugs for 30 days, then one oral drug for 60-150 days. If sensitive, choose two of three possible oral drugs: Amoxacillin-clavulanate TID, tetracycline TID, TMP-SMX BID.	Supportive care. May need ICU and ventilator for pulmonary edema.

See reverse side for additional Category B agents ➡